MACIEJ KOS, PH.D

OFFLINE: BROOKLINE, MA

ONLINE: MKOS.PL | GITHUB | EMAIL

Previously: Google, Roku, Philips Healthcare Research

EDUCATION

Northeastern University, Khoury College of Computer Sciences   2024

Ph.D. in Computer Science / Personal Health Informatics   Boston, MA

- GPA: 4.0/4.0
- Dissertation: Digital biomarkers of cognitive health: unobtrusive monitoring of cognitive changes using smartphones
- Selected awards:
  - NIH National Institute of Aging, Predoctoral Fellow (F99), 2020 - 2023
  - ACM/Intel Corporation Computational and Data Sciences Fellowship, 2017 – 2021
  - Network Science Institute Seed Grant, 2021
  - Northeastern University Dissertation Grant, 2020
  - Google Scholar, 2020
  - Multiple conference, workshop, and summer school awards omitted

University of Michigan, School of Information   2012

M.A. in Information Science   Ann Arbor, MI

Barcelona Graduate School of Economics   2009

M.Sc. in Economics of Science and Innovation   Barcelona, Spain

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SKILLS

- **Programming:** Python, R, Stata, SQL (GCP BigQuery, AWS Athena)
- **Statistics:** GLM (univariate, multivariate, some multilevel), SEM, psychometric modeling
- **Machine Learning/AI:** dimensionality reduction, clustering, SVMs, ridge regression, logistic classification, random forests, sequential pattern mining, LLM few-shot learning
- **Other:** data visualization, network analysis, qualitative UX research
- **Eager to learn:** signal processing, computer vision, deep learning, NLP

RESEARCH EXPERIENCE, ACADEMIA

Boston University Medical School (Anatomy and Neurobiology)   7/2024–

Postdoctoral Research Associate (Affiliate)   Boston, MA

As a volunteer, I contribute to:
- the Precision Brain Health Initiative
- Framingham Heart Study: Brain Aging Program

Northeastern University Center for Cognitive and Brain Health 6/2024–

Postdoctoral Research Fellow Boston, MA

- NIH NIA Career Award recipient (K00)
- Leads a DIGITAL BIOMARKERS research project on detecting changes in cognitive health using unobtrusively collected smartphone data by combining neuro approaches with data science, AI, and mechanistic modeling methods.

Northeastern University Khoury College of Computer Sciences 9/2015 – 3/2024

Graduate Researcher Boston, MA

"Digital Biomarkers of Cognitive Health" (Dissertation), with Dr. Pavel and Dr. Rampersad
- To infer changes in cognitive function, I developed software and algorithms for collecting and analyzing smartphone data collected passively (location and motion, typing speed and frequency of errors, app use, and screen events).
- Designed cognitive lab experiments, including cognitive and motor tasks and EEG.

"Measurement of collective physical distancing during the COVID-19 outbreak using large-scale mobility data" in collaboration with the MOBS lab, PI: Alessandro Vespignani
- Developed an approach for reducing selection bias in smartphone location data of over 40 million US users by combining well-established statistical techniques with multivariate simulations applied to geospatial sociodemographic data (Python, R).
- Helped build a pipeline for processing over 0.5 petabytes of data (Python, BigQuery).

"Strengthening Human Adaptive Reasoning and Problem-solving" in collaboration with Harvard, Oxford, and HoneyWell
- Built a statistical model to characterize the relationship between different types of brain stimulation, estimates of fluid intelligence, and performance during adaptive cognitive training (R).
- Helped develop a computational model of participants' performance during adaptive cognitive training (R).

"WearTech - determining the accuracy of wearable sensors for ambulatory stress monitoring"
- Used machine learning and signal processing techniques to develop a method for removing motion artifacts from heart rate data (R).
- The developed method improved upon Microsoft's state-of-the-art algorithm.

RESEARCH EXPERIENCE, INDUSTRY

Roku 6/2021 – 9/2021

Research Data Scientist Intern Remote

"Development and assessment of algorithms for creating lookalike audiences (ads)"
- Implemented and assessed methods for creating lookalike audiences using behavioral data (lift > 20x).
- Proposed novel algorithms for lookalike creation.

Google 5/2019 – 9/2019

User Experience Research Intern (quant) San Francisco, CA

"Quantification of Material Design (Google's open-source design system)"
- Developed an algorithm for computing website's cognitive complexity based on Shannon's entropy.

- Prototyped analytics pipeline to parse 400 billion pages and fuses Google's diverse signals about each website (e.g., vertical, location, reach).

Philips Healthcare Research   5/2018 – 9/2018

Research Intern (Clinical Data Analytics)   Cambridge, MA

"Intensive care unit of the future: health informatics technologies for preventing critical illness brain injury (CIBI)"

- Proposed and prototyped system architectures and UX of two clinical decision support systems for preventing delirium and CIBI using ICU data.
- Submitted two patent applications (internally).

Agile Axons (self-employed)   1/2013 – 8/2015

User Experience and Research Consultant   Poland and Rome, Italy

- Led a UX team developing a consumer-facing mobile app for a large Italian telco (with **McKinsey** and **Ericsson**).
- Consulted on research design and statistical programming for behavioral finance and economics projects.

SIDE PROJECTS

- **Child Aid:** Analyzed data and consulted on research design for a large-scale experimental intervention to increase the literacy of Guatemalan children.
- **Lives of Dissidents:** Led UX research and design effort to help launch a charity project dedicated to spreading the message of peaceful dissent as a means of dissolving oppression.

ADDITIONAL ACTIVITIES

- Ad hoc reviewer for SIG Human-Computer Interaction, IEEE Engineering in Medicine and Biology Society, and American Medical Informatics Association, PLOS ONE
- Northeastern Personal Health Informatics Faculty Committee, 2018/2019 – elected student representative
- Poland Foresight 2020 national research program – external expert

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PAPERS, PRESENTATIONS, AND POSTERS (SELECTED)

1. Klein B., LaRock R., McCabe S., Torres L., Friedland L., **Kos M.**, Privitera F., Lake B., Kraemer M., Brownstein J.S., Gonzalez R., Lazer D., Eliassi-Rad T., Scarpino S.V., Vespignani A., Chinazzi (2024). *Characterizing the collective physical distancing of the United States during the first nine months of the COVID-19 pandemic.* PLOS Digit Health 3(2): e0000430. https://doi.org/10.1371/journal.pdig.0000430

2. Jimison, H., **Kos M.**, Pavel, M. (2022). *Early Detection of Cognitive Decline Via Mobile and Home Sensors.* In: Hsueh, PY.S., Wetter, T., Zhu, X. (eds) Personal Health Informatics. Cognitive Informatics in Biomedicine and Healthcare. Springer, Cham. Online version: https://rdcu.be/c1niL

3. Pavel M., Caves K., Jarvis L., Hasson C.J., Kos M., Jimison H. (2021). *Unobtrusive, Continuous LIDAR-Based Measurement of Gait Characteristics at Home.* Paper presentation at the 43rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Virtual

4. Klein B., LaRock R., McCabe S., Torres L., Friedland L., Kos M., Privitera F., Lake B., Kraemer M., Brownstein J.S., Lazer D., Eliassi-Rad T., Scarpino S.V., Vespignani A., Chinazzi M. (2020). *Reshaping a nation: Mobility, commuting, and contact patterns during COVID-19*. Presentation at COVID-19 Satellite of Sunbelt XL, International Sunbelt Social Network Conference, virtual

5. Kos M. (2020). *Towards a digital biomarker of cognitive health: passive monitoring of cognitive changes using smartphone-based data.* Poster presentation at the Computing Research Association Grad Cohort Workshop, Austin, TX

6. Kos M., Yew J. (2019). *Computational methods for understanding cognitive density preferences; foundations for adaptive user interfaces.* Google Ph.D. Intern Research Conference, Mountain View, CA

7. Kos M., Pavel M., Jimison H. (2019). *How to Validate Heart Rate Monitoring Wearables for Just-in-Time Adaptive Health Interventions? Development of Comparison Testing Guidelines.* Poster presentation at the Annual American Medical Informatics Association Symposium, Washington, DC

8. Kos M., Ponnada A., Pavel M., Intille S. (2019). *Evidence That Microinteraction Ecological Momentary Assessment (µEMA) is a Non-Reactive In-Situ Affect Assessment Method.* Poster presentation at the Society for Affective Science Annual Conference in Boston, MA

9. Kos M., Gordon C., Li X., Khaghani-Far I., Pavel M., Jimison H. (2017). *The Accuracy of Monitoring Stress from Wearable Devices.* Poster presentation at the Annual American Medical Informatics Association Symposium, Washington, DC

10. Kos M., Li X., Khaghani-Far I., Gordon C., Pavel M., Jimison H. (2017). *Can accelerometry data improve estimates of heart rate variability from wrist PPG sensors?* Paper presentation at the 39th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, South Korea